National Aeronautics and Space Administration

Antenna Deployment and oPtimization Technologies (ADaPT)

Conformal Phased Array Antenna Technologies for Enhanced Aircraft Communications

Challenge

- Increased airspace density from AAM and other new applications will result in more potential for RF interference.
- Increased interference lowers reliability and security of the communications link, requiring mitigation strategies to support a larger number of users.

Expected Impacts

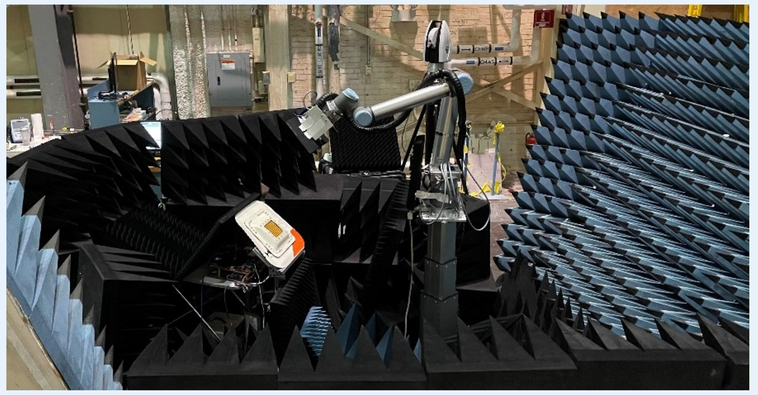
- Enables safe and efficient aviation operations by reducing communication interference.
- Enables high performance and low interference beyond line-of-sight communications.

Solution

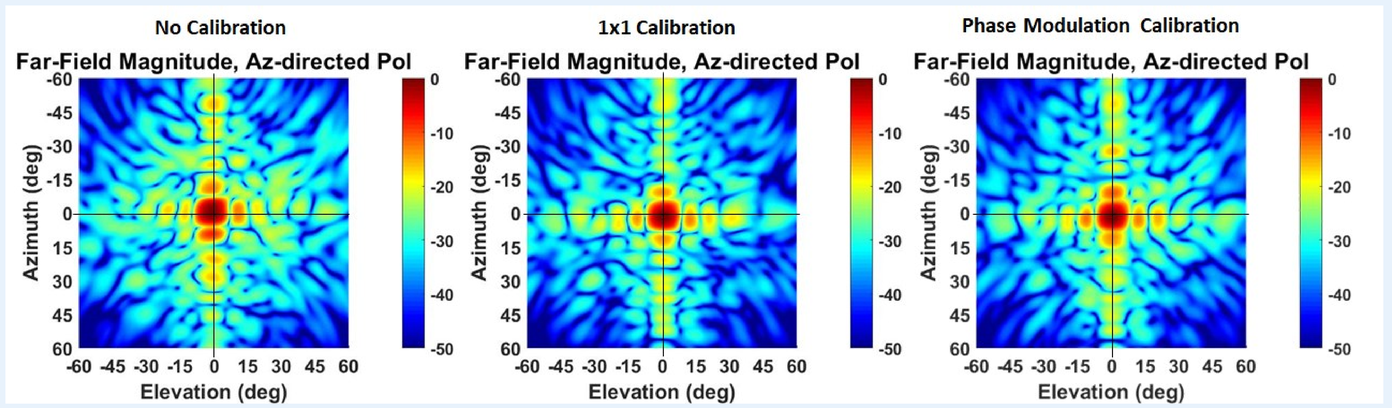
- Development of phased array antenna technologies that can mitigate interference through spatial separation and electronic beamforming.
- Development of conformal phased arrays made of aerogel material that can be mounted on aircraft surfaces.
- Investigation of novel calibration techniques to increase effectiveness of phased array antenna beamforming when coupled to aircraft structures.

Interference Mitigation Enables Reliable and Secure Communications

Conformal Phased Array Antenna on Aircraft



Antenna Calibration using the Portable Laser-Guided Robotic Metrology (PLGRM) System



Antenna Pattern Correction using 1x1 and Phase Modulation Calibration Methods

Results

Improvements to overall antenna performance due to on-aircraft calibration:

- Improved antenna pointing accuracy (~2 degrees)
- Reduced radiated side lobes (~ 8 dB) that may cause interference
- Improved balance of radiated side lobes

Next Steps

- Develop Gen II Aerogel Phased Array Antenna
- Conduct ground demonstrations of Gen II array
- Conduct flight demonstrations of Gen II array

Partners and/or Participants

- Eutelsat America Corp - Flight Demos
- Naval Air Warfare Center Aircraft Division - Flight Demos
- UC San Diego and Extreme Waves, Inc - Antenna Calibration Methods
- San Diego State University - 5G Array Development
- NASA Space Technology Mission Directorate – Flight Demos

Points of Contact

Eric Knoblock, Bryan Schoenholz, James Downey
NASA Glenn Research Center

IMAGINAVIATION